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Hawaiian Sugar Crop 1904.

The latest revised estimates for this crop place the total tonnage of all plantations at 395,000 short tons, possibly going to 398,000 short tons.

The total of the last crop was 437,991 short tons, and had it not been for the leaf-hopper and other causes, the 1904 crop would have been equally as large.

We notice that Messrs. Willett & Gray have estimated this crop at 393,000 long tons, equalling 440,000 short tons. This estimate, under ordinary circumstances, would not have been far wrong; but since it was made conditions have changed, and the figures herein given, namely 395,000 short tons, are considered as nearly correct as possible.

The cause of the decrease is mainly due to the leaf-hopper, which has spread generally over all the Islands, and in its attacks on the cane has spared but few of the plantations. In some places, owing to vigorous growth of the cane, due to abundant moisture, hardier varieties of canes and insect parasites, the leaf-hopper has been held in check; but in other localities, where conditions favored the pest, much damage has been done.

We have but to quote from a few of the published reports of the plantations to show to what extent the estimates of the crop previously made have been reduced for this reason:

"Crop of 1904: Our estimate for this crop is 3502 acres, what the yield will be we are not in a position to say as the leaf-hopper has commenced to attack it and we may find it necessary to cut fields not fully matured to save what sugar we can from this pest.

Crop of 1905: Owing to the light rainfall for six months after commencing planting for 1905 crop, the leaf-hopper pest had every advantage in its favor and increased in such enormous numbers that at this writing it is safe to say over one-half of the young plant and ratoons for 1905 is actually dead or beyond recovery."

The foregoing quotation is from the report of a plantation which has harvested annually for the last five years an average of 12,000 short tons of sugar.

Another report says:

"While these accidents are discouraging and will cost several thousand dollars, they are nothing compared with the prevailing insect pests. The inroads of the leaf-hopper and mole cricket in the cane fields of the Islands are very disheartening; the former especially has so far cost us hundreds of thousands of dollars, and I feel perfectly safe in saying that our last crop would have been six thousand tons larger had it not been for the damage wrought by this pest."

Again:

"Acreage of cane to be harvested in 1904: Of the 1225 acres to come off, nearly all has suffered from the attacks of the leaf-hopper; 220 acres being totally destroyed."

We could quote from a dozen reports all to the same effect and showing that the yield has been overestimated.

So far as the leaf-hopper is concerned we believe that in the course of a year or two it will be under control, if not completely eradicated. Professors Koebele and Perkins, who went to Australia last wek, are sanguine that they will there find a parasite or parasites of the hopper which will effectually control it.

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Rome, March 12, 1904.

Communications.

Editor Planters' Monthly:

In your January number was published a letter written by Mr. John Anderson, who was for some time engineer for the Makee Sugar Company, which letter is in my opinion not only delusive but might be considered a reflection upon my judgment as owner and the one solely responsible for the methods and machinery in use by said company.

I propose, with your leave, to make a brief statement concerning the methods and machinery criticized by Mr. Anderson, premising that as I am not a professional (nor writing for professionals), I will use no technical language.

KILBY PANS.

Mr. Anderson being a sturdy and steady "Scotsman," with a bonny wife and numerous bairns, I am not in the least surprised that he disclaims being *"enamoured"* of my vacuum pans! But, seriously, let us take it for granted that *he meant to express his opinion in disfavor of the pans,* and then see how far he is right.

He does not claim to know anything about "sugar boiling," but bases his objections upon what seemed to him, as an engineer, mechanical faults which he designates as "the size, length, and disposition of the coils; the height of the pans, and the want of facilities for repairs to the coils." He further expresses the opinion that "coils of such size and length as these long ones, and lying almost flat as they do, can not do very effective work."

Now it strikes me that if Mr. Anderson wrote for the benefit of other engineers, presumably as intelligent as himself, it was only necessary to give the dimensions and conditions of the "coils," leaving readers to form their own opinions from the facts or, if he wrote for the benefit of people who did not know the use of a "coil," to simply say "Mr. Spalding has established vacuum pans at Kealia the coils of which cannot, in my opinion, do effective work." But perhaps he was trying to meet the requirements of both classes, and if so, I will try to aid him.

The history of what is known as the "Kilby Pan" is as follows:

Some years ago, I made a trip through the beet sugar portion of Germany for the purpose of investigating supposed improvements in method, and machinery used in the manufacture of sugar. I found two vacuum pans generally regarded as the best and about equally in favor. One was supplied with a large number of "spirals," rather than coils," made of iron piping of small diameter; the other had a number of coils, either iron or copper, placed one above the other and *returning upon themselves* so that the outlets would come on the side of the pan, instead of at the bottom as in the old styles.

Considering the *iron* coil, or spirals, rather unfitted for cane juice, I chose the returning coils made of brass or copper. This pan was patented by the makers on account of *a sliding gate* by means of which the inlet valves could be opened, one after another from the bottom up, by a man standing on the floor. This gate was the only thing about the pan I did not like!

Returning to the United States, I explained to Mr. Kilby the principle of the returning coils (upon which no patent could be taken) and he had a design made, with arrangement of the inlet valves in groups so as to be handled from iron stairway, and that was the birth of the "Kilby Pan."

Mr. Anderson complains of *the height* of my pans. Well, I admit that the high vacuum pans now so universally used by the most advanced manufacturers of sugar, especially in Germany, are contrary to the old "chafing dish" styles so long advocated by English and Scotch makers; and possibly mine (with their 19 coils) looked to him like an exaggeration. The difference is as great as between the old Scotch flue boilers and the modern "tubulars" or "uprights;" but all have their good points.

Even an engineer is presumed to know that a vacuum pan is for the purpose of evaporating the water from cane juice and enabling the saccharine matter to crystallize in the form of sucrose or sugar. But not all engineers know that cane juice contains many ingredients besides saccharose, and that some of these ingredients (known to sugar chemists under the general term of "molasses makers") prevent the full and perfect crystallization of the saccharose. Acidity and heat are known to be most efficient in developing these "molasses makers," and in changing saccharose into some form of glucose or uncrystallizable sugar; so *boiling in vacuo* is resorted to on account of the lesser heat required. The *high* vacuum pan, with many small diameter coils, has been found most effective with low degree of heat or temperature, and has been adopted by the most scientific sugar producers (the Germans), as I before said.

But what Mr. Anderson seems to regard with greatest disfavor is *the returning coil* of the Kilby Pan. Now, I do not object to criticism regarding either myself or anything that belongs to me; but I prefer to have the critics make plain whether the defects they object to are natural or acquired, theoretical or mechanical! If a machine or apparatus be theoretically correct, imperfect construction should not condemn the principle; and if it be contrary to good theory no mechanical skill can save it. Therefore, I object to Mr. Anderson's letter, which seems to sneer at the principle involved in the Kilby Pans, generally, while he only attempts to justify his opinion by reference to what he considers were mechanical shortcomings in the particular pans used at Kealia.

Let us take, for instance, the question of coils. Of course, the object of the coil is to convey the heat of steam into the liquid to be evaporated. When this is done in such manner that the water of condensation (called drips or exhaust) be practically of no higher temperature than the surrounding liquid then the coil will have done all that is possible with the amount of steam admitted. So long as the content of the coil be of a temperature greater than the liquid it will be effective whether in the form of steam or water; but, of course, in order to produce violent ebullition there must be considerable difference in the degrees of temperature. The ordinary average temperature of the contents of the vacuum pan, when boiling sugar, is way below 200°, and water of condensation is easily above. So if a portion of the coil contains water it is not necessarily prejudicial to the "effective work" of the pan!

Reduced to practice all this means that the sugar boiler has a given amount of work to do and must have *heat to do it with.* If his heating surface (coils) be limited, and he yet requires quick work, he must carry as much steam and as little water in his coils as possible. Here is the gist of the whole thing. *I do not believe in quick boiling nor high temperature,* and the Kilby Pan was designed to work on my ideas. If Mr. Kilby failed to inform purchasers that the pan was not intended for high pressure steam, I don't know that the fault was mine, or the pan's, either!

I freely acknowledge that, at Kealia, we have had "troubles" with the pans, which Mr. Anderson has told of in the following words: "Their drainage gave trouble from the first, especially the live steam drainage. Concluding that the uncondensed drainage from the short lower coils was retarding the water from the long upper ones, we separated them *and stopped the trouble.*"

This was written to a plantation manager (an engineer by profession) who undoubtedly understood what is meant. But as your readers are not all *sugar experts*, nor even engineers, I may be allowed to explain that the coils in the Kealia pans took their supply of steam from, and discharged their "drips" or water of condensation into, manifolds so connected that either high or low pressure steam could be used at will. But each steam (high and low pressure) had its own manifold, so that live or high pressure steam might be used in some of the coils while exhaust or low pressure steam was being used in the others. Mr. Anderson does not mean that the "live steam drainage" gave trouble by interfering with the drainage of coils using low pressure steam (as might be inferred from his words) but that the drainage from the short coils interfered with the drainage from the long coils; and when he says "*We separated them and stopped the trouble,*" he means that the discharges of the lower (short) coils were disconnected from the manifold, leaving only the upper (long) coils to discharge into it.

The pan is cylindriform, with bottom just sufficiently tapering to make discharge easy, and of course in this bottom or lower section the coils shorten rapidly. It was manifestly an error to allow these coils to exhaust into the same manifold with the longer coils; but, theoretically, it seems easy to regulate the discharge (that is allow nothing but water to pass out of any of the coils) by simply opening or closing the valves. As a matter of fact it is one of the hardest things to do; and I would be glad to see each coil separately trapped, so as to be sure of results.

The other objections are hardly worthy of notice. The "swinging discharge gate" is made large for obvious reasons. Quick discharge of very dry massecuite is more important than "cutting." As to sending a man inside the pan, for the purpose of "scraping the coils," I may remark I haven't done that for many years. I prefer "boiling out." Lastly, I may say that we *have* lately "removed the coils" from one of the pans, repaired the supports, and replaced them—although it is something of a job, as the vapor pipes are quite large. But we do not expect to have much of that kind of work to do.

As against Mr. Anderson's opinion I would like to go on record as follows: In all my experience of over 35 years, I have never known a vacuum pan superior, if equal, to the Kilby Pan constructed mechanically perfect.

SAND FILTERS.

I now desire to notice the opinion of Mr. Anderson, which you give publicity to, concerning the Sand Filters used at Kealia. To be sure he includes *all* "Sand Filters" in his general description as "cumberers of space," and even gives those at Kealia the compliment of being able "to filter certainly, *with the aid of a hoe!*" I have heard of "damning with faint praise;" but I think this is too faint, both as regards source and substance, to have much effect. Hereafter I may require my engineers to express their opinions *in advance*, in order that I may properly apologize *if I use hoes*, and things, contrary to their judgment.

Seriously, again, I find myself under the necessity of explaining to your readers in order that they may judge whether this ignorance regarding "Sand Filters" is attributable to me, or to Mr. Anderson, himself.

Some years ago, when I was using "Diffusion" and first began *superheating my cane juice* (which was before Mr. Deming started his "System of Clarification") my chemist, Mr. Schmidt, found in our juice a "molasses maker" that gave us a great deal of trouble. I will not attempt a description, more than to say that the juice showed, to the eye, small whitish particles of a density or specific gravity so nearly that of the juice itself, it was almost impossible to get rid of the objectionable matter by any of the methods of clarification known to us. Finally we discovered that filtration *through coral sand* gave us the desired result, and we built (upon the plantation) our first Sand Filters. Those we now use are practically the same in principle.

I may here remark, in proof of work done by them, that we generally find the surface of the sand quickly covered with a slimy substance through which no liquid can percolate. This, of course, varies according to conditions of the juice as well as the perfectness of the previous clarification by settling; but, as I have said, it is impossible to clear the juice from this matter (decomposed by heat) in any ordinary settling tanks.

We use the hoe to break up the surface of the sand, when so smeared over, and thus extend the filtration until the whole charge of sand needs renewing. We sometimes filter the *heavy juice* first, over clean sand, and then follow with the light juice. These are matters of detail I have no intention of forcing upon your readers at present. I only desire now to set aright any wrong impression that may have obtained from Mr. Anderson's letter.

Notwithstanding his "own personal experience" he is evidently ignorant of results obtained at Kealia, and I do not object to his asking for information. Therefore I answer his question "Is the game worth the candle?" by saying *it depends upon the cost of the candle. I think it pays;* and until Mr. A. can show that it does not, I see no reason for his sneering *at the man with the hoe!*

EVAPORATORS.

The next criticism is devoted to my Quadruple Effect, which he admits "has done very well," *but only on account of its size!* He gives his opinion that "a good Standard Effect" is about the best of anything that has as yet been tried; but he does not tell us whether or no *a small* "Standard" will do big work!

It may be news to some of your readers, and to Mr. Anderson also, to learn that I used one of the first sets of Double Effects ever brought to the Islands. These were of the upright style, called "Standard," and were made by Pontifex & Wood, London. I afterwards had a set made by Mr. Young, same pattern save the use of "drums" instead of "tubes," and from these two sets I made a combination to be used either as a "Triple" or "Quadruple" Effect. This was before the days of "film evaporation;" but when Mr. Yaryan invented his Pan we adopted the principle by simply carrying less juice in our "Standards," and working faster.

From "my own personal experience" I *know* (instead of thinking) that a "Standard" style Effect is good, safe, and reliable. But the "Standard" has its limits, in economical construction, unless you increase *the height* to which Mr. Anderson so strongly objects!

I will not trouble you with a long account of the bother I had with my "Welner-Yelnick," owing to a fault in originally setting it up. Suffice it to say that it is true (as Mr. Anderson says he "*believes*"?) "all loss by entrainment has been stopped," though not as he says by "the addition of baffles and catch alls," but by establishing proper differences of vacuum in the different pans through drawing off the "drips" and amoniacal gases through a single pump. It is true we resorted to baffle-plates and screens, for temporary relief, but with proper circulation and division of vacuum no Effect should require such aids, save in case of accident.

It would be a long story to tell how the original "Wellner and Yelnick" Effect depended upon a series of pots, with valve and siphon attachments, for the drainage of its heating tubes and removal of gases, all of which we have now discarded in favor of the automatic action produced by drawing the drips through one pan to another by a single pump. I need only say it is successful, and that in my opinion no "Effect" can do better or more work on a given amount of steam than the one we are using.

NINE ROLLER MILL.

Mr. Anderson writes as follows: "Touching first on roller setting. I am convinced that—under some misapprehension—considerable nonsense has been written and spoken on this subject."

I quite agree with Mr. Anderson, and only regret he had not held the same opinion regarding other subjects! What he says regarding the mechanical working of the mill, being what he learned at Kealia, is well explained. Regarding the "water-jacketed bearings," which as far as I know were his own idea and first applied at Kealia, I give approval without reservation. His views upon

MACERATION

are a little vague, possibly because here comes in something more than mechanics. Speaking of "returning third mill juice" he says, "As to its economic value in increasing the extraction, I have never been able to see the philosophy of it."

In plain words I should say that the theory or explanation is simply that if the clear water of maceration be used on the bagasse going into the 3rd mill the juice from that mill will be weaker than the juice *in the begasse going into the 2nd mill*, and therefore can be used to macerate that bagasse; and this will allow double maceration with any given per cent. dilution.

"Maceration" is not "Diffusion," as applied to sugar cane whether in form of "chips" or bagasse, although the mixing of two or more liquids into one perfect whole is a "diffusion" of those liquids. The practice, as in Australia, of "immersing the bagasse in a hot bath of water or weak juice, between the different mills," as reported by one of your correspondents, is simply maceration carried to the point of complete saturation.

I hope you will not think I have written from any ill-feeling or spite. Mr. Anderson proved himself, while in my employ, to be a very fair engineer and only left Kealia of his own accord. I never regarded him as "a sugar man," nor thought of asking his opinions upon methods to be used (outside the mechanical appliances necessary) and I never heard of his having experience beyond his own department. I do not object to my employees having opinions of their own upon any subject; but when those opinions are expressed in public, or in print, and by their delusiveness or mistaken statements tend to discredit my business methods (among strangers) I claim the right of exposing the malice or ignorance in an equally public manner—always holding myself responsible, of course, for the language used.

If you find my explanations of no benefit or interest to your readers, you have my full consent to amend this article by striking out all after the words "Editor Planters' Monthly," and inserting as follows: "With best wishes for the success of 'The Hawaiian Planters' Monthly, in promoting the interest of the sugar industry, and heartily responding to the opinion expressed by my friend, Mr. Andrew Moore, when he said, 'Each plantation has its own conditions to govern its work, the manner of doing it and its cost.'" I am yours truly,

Z. S. SPALDING.

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Kukaiau, Paauilo, Hawaii, April 10th, 1904.

Editor Hawaiian Planters' Monthly:

Dear Sir:—I have read with much interest your valuable article "The Fuel Question in Our Sugar Houses," and think the many points are generally well taken, and are worthy of serious consideration.

It is undoubtedly true that a vast deal of trouble and expense would have been saved had there, at times, or in some instances at least, been better care and judgment displayed in care and management of the boiling apparatus in our sugar mills; nor can it be too forcibly impressed upon the minds of engineers and sugarboilers, the importance of keeping these boiling apparatus scrupulously clean, both inside and out.

But I will say there is not now nearly so much trouble in this respect. There is often more trouble in the burnaces, boiler, boiler setting, etc., than in the boiling house. What is said of the cylinder oil fouling the tubes of the triple effect, etc., and other boiling apparatus is also too true. In fact I have known of one mill where the fouling of the tubes of the Lily effect was so great, through the exhaust of the Westinghouse engine being put into it, as to put that valuable machine out of commission. And I have heard of other instances where barrels of oil and dirt were taken out of them. Indeed it is a problem up to the present day to properly eliminate this oil; that is throughly doing it. There are devices for this purpose in the market, but so far as I can learn they are not entirely effective. We have one at this mill, which is made of redwood and which is divided into several compartments, and in which the water of condensation is made to flow through several layers of trash. This simple contrivance eliminates, or separates, quite a quantity of oil from the water, and is probably as good as a more expensive apparatus. Boiler compounds are also used for this purpose.

It is also true that a great deal of money has been wasted experimenting with new style furnaces, and no doubt many foolish things have been suggested, and many useless alterations have been made; but at the same time, some progress has been made in furnace construction. I will say that I consider that combustion is the most important and most difficult problem that confronts the engineer, and fortunate indeed is the man that has solved it; and therefore, unlike your correspondent, I am a strong believer in the CO2 scientist, but believe this man should be the engineer. The great trouble with the CO2 scientist is not in the theory, but in the practice. He has generally advocated extensive alterations, when no alterations were needed. In most instances all that is needed is a proper regulation of the air supply. And this air supply is the one great secret of combustion and which can only be learned through the aid of gas weighing, or gas absorbing machine.

We have such an apparatus at this mill, and we have learned a great deal about combustion from its use.

We have learned, for instance, that a great deal of air is needed above the grates, something which is in direct opposition to the old-time theory.

We also find by giving this required amount of air above the grates we save more fuel, get more steam, and consequently get better combustion.

One evidence of combustion is the absence of smoke, and as a general thing, no smoke is seen to issue from a stack or chimney where perfect combustion is going on. To show that we have made some progress in this direction. We can at will cause the smoke to issue from the chimney as black as night, or stop it altogether, simply by changing the air supply.

I am a strong believer in the Dutch-oven type of furnace, and have known of half a dozen mills that have made a great improvement in the combustion simply by adopting this type of furnace.

The Dutch-oven furnace has a much higher temperature than the ordinary furnace. This is due to the fact that the heat, flame and gases first strike the red hot arch instead of being absorbed by the boiler, and as it is considered that the higher the temperature of furnaces, the better will be the combustion, this style furnace must be superior to the old kind. It is also found that the longer the arch, up to nine feet, the better the combustion. This fact has been proven by everyone that has made the change from the common to the Dutch-oven type of furnace.

This was very evident at the Laupahoehoe Sugar Co. Mill where I first saw this style of furnace, and so great was the heat as to make great cracks in the side of the walls, something never done by any other kind of furnace. The same results were seen at the Kukaiau mill, and many others where this change has been made.

This furnace when fitted with the step-ladder and horizontal grate bars and with hot air pipes, and having flues on each side of the furnace and coming out at the bridge-wall, after Jarvis style of furnace, is very effective.

The adoption of the hot air pipe was a move in the right direction, but they do not give one-tenth enough air above the grates to be very effective. Firing automatically has also improved the combustion wonderfully.

But there are many other ways of increasing efficiency of the fuel, and one of the most important and economical methods is to carry high pressure steam, at least for engines; 70 lbs. may do for the boiling house, but it is entirely insufficient for the engines, which should be not less than 100 or 120 lbs. pressure.

Another important thing is to have the engines indicated frequently. An indicator does not cost much, and there are times when it is worth its weight in gold. Good steam traps are also often found very valuable in preventing loss of steam. One important cause of loss is frequently due to the bad or imperfect design of the machinery, boiler, etc. Sometimes an engine, pump or some other class of machinery will be put in use that is either too large or too small for the work, and which always result in loss.

I have seen old mills so crowded with new machinery as to make the original piping quite inadequate to carry the steam. In such instances the pressure in the exhaust pipe would be raised to 10 or 15 lbs. while the friction in the steam pipes must have been immense, and the loss resulting from such an arrangement must have been enormous.

But often there is not time in some of the mills, that have large crops to take off, to make the necessary changes, and therefore they get along the best they can. It is also often more difficult to get everything properly designed, when adding new machinery to an old plant, than it was to design the mill in the first place; for while one thing will do well sometimes in one place, it will not always do so in another, and so every engineer has to solve the problems of his own particular plant himself.

In regard to furnaces, I will say it is my opinion that such furnaces as the "Burt," fitted with the Gordon Hollow Blast Grate, may possibly surpass our style furnace, and it might be worth while to experiment along these lines.

Yours respectfully,

GEO. OSBORNE.

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VARIETIES OF CANE.

By C. F. Eckart.

(Experiment Station and Laboratories of the Hawaiian Sugar Planters' Association. Press Bulletin No. 1.)

Probably no subject pertaining to the cultivation of cane in the Hawaiian Islands during recent years, has held more interest for the planters, in various localities, than that relating to the introduction and trial of new varieties.

In the Hilo and Hamakua districts, the Lahaina first made way for the Rose Bamboo, and the latter, after a strong stand for many years, is now being rapily succeeded by the more vigorous Yellow Caledonia. This cane with its upright growth and deep rooting propensities has proved a most valuable acquisition in wet and dry localities alike. Growing erect, with a natural tendency to shed its dried leaves, it becomes an admirable cane for rainy districts, where varieties that are prone to fall to the ground and remain in contact with a frequently saturated soil have shown extreme sensitiveness. The frequent stripping, required for Lahaina and Rose Bamboo in these wet places, has necessarily added to the cost of cultivation, and the ready manner in which Yellow Caledonia tends to strip itself is no small item in favor of economy. Again the manner in which it keeps down weeds, which were such a menace to its predecessors on the unirrigated plantations, is another strong point in its favor. In dry districts subject to occasional drought, it has amply demonstrated its hardihood over Rose Bamboo, which in turn is more resistant to such unfavorable climatic features than Lahaina. By sending its roots down deep into the soil it draws from a larger reserve supply of water than the older varieties, which are more shallow feeders and which soon feel the effects of a rainless period.

The substitution of hardier varieties, in localities subject to varying and adverse weather conditions with their train of insect and fungus depredations, as well as the constant aim to produce a cane of higher sucrose content, less fiber, and superior milling qualities in more favored regions, has formed a subject for continued investigation in nearly all sugar growing countries. Within the past ten years we note the passing of Rappoe (our Rose Bamboo) in certain districts of Queensland, where through gradual deterioration it finally reached a stage when it could no longer cope with diseases from which it had previously suffered but little damage. In 1890 the Bourbon (identical with the Lahaina), which had grown for many years as the standard variety of Barbados, began to be replaced by varieties which showed a greater resistance to disease and insect attacks, and we note a favorable report concerning Caledonian Queen, Striped Cane, Queensland Creole, etc., with regard to their immune characteristics. Today a superior variety and a seedling has come to the front under the name B. 147 and has become firmly established as the standard cane of Barbados and other points in the West Indies.

The introduction of new varieties into the various sugar-growing countries of the world, while attended with profitable results in many instances, has given rise to considerable confusion regarding their nomenclature. Often, on becoming established in their new homes, the canes receive local names, which in time entirely replace those under which they were imported. A signal success with one of these newly introduced varieties, under its new environment, results at times on its being returned, on request, to the country in which it originated, under the impression that it is a new cane with valuable qualities, and consequently worthy of trial. Naturally this change of habitat is productive of certain modifications in the cane, which, though superficial in some instances, cause it to be grown for many years along side of its near relative, descended from the same stock, before it is identified as the same variety. We thus find our Lahaina passing under the name of Bourbon, Colony Cane, Otaheite, Loucier, Portier, Bamboo ii, China ii, and Cuban. The Rose Bamboo has received the appelation of White Transparent, Caledonian Queen, Blue Cane, Light Purple, Rappoe, Mamuri, Hope, and Light Java.

It is interesting to note the changed characteristics of the same variety after having been subjected to different soil and climatic influences during many years. For instance, if we endeavor to trace back to their original ancestors our Lahaina, introduced into these islands from the Marquesas Group by Captain Pardon Edwards, and the Otaheite, received from Louisiana some years ago, it appears that they came from the same stock. From the coast of Malabar, India, this variety (for they are the same) was shipped to Reunion, Mauritius, and Madagascar, and from these points it was received by the West Indies and the islands of the Pacific. From the West Indies "Otaheite" was introduced into Louisiana and from Louisiana into Hawaii, while the "Lahaina" came from the other direction and reached Hawaii by way of Marquesas. When brought together at the experiment Station and grown side by side under the same conditions of soil, climate, irrigation, and cultivation they resembled each other closely and only differed in their value as sugar producers and in the diameter of the stick. A comparison of these canes at the Station may be shown by the following figures:

	Lahaina.	Otaheite.
Cane per acre	116,015 lbs.	120,516 lbs.
Sugar per acre	18,377 lbs.	13,450 lbs.
Fiber	11%	10%
Brix of juice	19.62	15.07
Sucrose of juice	17.8	12.4
Purity of juice	90.72	82.28

In 1903 a small lot of Otaheite was harvested which made a somewhat better showing than the above.

The difference in yields and other characteristics, manifested by the same cane under different climatic conditions, indicates forcibly the necessity of experimenting with varieties in as many localities as possible before it is condemned as a poor sugar producer in these Islands. This point is brought out most clearly in the case of the Yellow Bamboo, which thrives at high elevations in Kau and at a point where Lahaina would prove a failure. At the Experiment Station, on a low level with corresponding differences of soil and climate, the Yellow Bamboo produces only one- half as much sugar as Lahaina. Another good illustration of this point is amply afforded by the Salangore variety. In the Straits Settlements, after being tried in competition with many varieties, it was found to take the lead with Lahaina standing second. Grown at the Experiment Station in Honolulu, Salangore made but a poor showing compared with other canes, and owing to the limited area of land was dropped from further trial in order to make room for more promising canes.

Salangore at the Experiment Station:

Cane per acre	95,832 lbs.
Sugar per acre	13,081 lbs.
Fiber in cane	11.37%

Juice analysis:

Brix	17.67
Sucrose	15.4
Purity	87.15

Climate and soil are the paramount influences exerted on the sugar producing capacity of different varieties, and of these two conditions it is difficult at times to note which has the more determining effect on crop production. At a central station where varieties are grown on the same soil, a different order as regards their yields is often manifested from year to year, and if attention to this change in the scale of production is supplemented by a careful comparison of weather conditions during separate periods, an indication is afforded as to the localities in which certain canes may profitably be tried. Another cause which tends to change such an order among varieties is the difference in the rapidity in which canes become acclimated. One which becomes adapted to its new environment more quickly than another, is not necessarily going to hold a superior position over the other when it in turn has gradually become accustomed to its new home.

A difference in the time of maturing may also prove prejudicial to the showing some varieties may make when grown in competition with others, and this point is worthy of consideration. For instance, if we cut all of the varieties at one time (as is usually done) for the purpose of comparing their relative productiveness, some of them which matured earlier than others may be already "going back" as we say, and this brings them into unfavorable comparison with the more slowly maturing canes. Demerara No. 95, for instance, has been observed to deteriorate rapidly after it has become fully ripe. This difference in the rate of maturing must also affect in some measure the vitality of the seed cuttings. For instance, if we are growing a dozen varieties for seed to be planted out in competitive plat experiments, it can readily be seen if these are cut at a certain age (say at 11 mos.) some varieties will furnish more mature cuttings than others and consequently the eyes germinating with different degrees of vitality will influence the ultimate yields of sugar.

Such considerations as the above make it necessary that varieties shall be grown in competition through a number of seasons before we attempt to draw conclusions as to their relative worth and take one from among the rest as a standard cane.

At the Experiment Station a number of varieties were recently harvested and the weights of each were taken from an area sufficiently large to indicate their respective merits under such conditions as obtained at the Experiment Station during 1902-3. The yields were as follows:

Variety.	Sugar per Acre.
Demerara No. 117	26,540 lbs.
Cavengerie	25,995 "
Striped Singapore	22,661 "
Queensland No. 1	21,878 "
Yellow Caledonia	21,808 "
La. Purple	21,232 "
Queensland No. 7	21,100 "
Big Ribbon	19,812 "
Demerara No. 74	19,354 "
La. Striped	19,067 "
White Bamboo	18,604 "
Tiboo Merd	18,044 "
Queensland No. 4	15,996 "
Demerara No. 95	15,158 "
Queensland 8A.	14,622 "
Gee Gow	14,402 "
Yellow Bamboo	12,307 "

The Fiber stood as follows:

Variety.	Fiber.
Cavengerie	12.7 %
Gee Gow	12.2
Tiboo Merd	10.0
La. Striped	10.0
La. Purple	9.8
Queensland No. 1	10.75
Queensland No. 4	11.0
Queensland No. 7	12.5
Queensland 8A	11.0
Demerara No. 74	9.8
Demerara No. 95	11.1
Demerara No. 117	11.5
Yellow Bamboo	12.3
Yellow Caledonia	11.1
Big Ribbon	11.3
Striped Singapore	10.3
White Bamboo	13.1

Analysis of juice:

Variety.	Brix.	Sucrose.	Glucose.	Purity.	Gums.
Cavengerie..	18.14	15.8	.752	87.1	.60
Gee Gow	17.76	16.1	.301	90.7	.39
Tiboo Merd	16.23	13.9	1.044	85.6	.44
La. Striped..	17.56	15.9	.413	90.5	.45
La. Purple	17.11	15.5	.381	90.6	.48
Queensland No. 1....	16.13	13.9	.978	86.2	.57
Queensland No. 4....	16.33	14.2	.845	87.1	.54
Queensland No. 7....	18.98	16.8	.205	88.5	.85
Queensland. 8A	16.91	14.8	.339	87.5	.51
Demerara No. 74	16.47	14.2	.404	86.2	.56
Demerara No. 95	17.43	15.7	.324	90.1	.42
Demerara No. 117....	17.16	15.2	.459	88.5	.52
Yellow Bamboo	16.99	14.7	.472	85.9	.56
White Bamboo	18.54	16.1	.288	86.8	.72
Yellow Caledonia. ..	18.74	16.2	.325	86.9	.74
Big Ribbon	17.29	14.7	.549	85.0	.64
Striped Singapore ..	17.36	15.5	.563	89.3	.48

Demerara No. 117 still holds the lead among the recently introduced varieties, and is a promising cane worthy of trial under the diversified conditions of the Islands. Yellow Caledonia, Demerara No. 74, Cavengerie, Striped Singapore, Queensland No. 1, and Queensland No. 7 also produced heavy yields. White Bamboo, Queensland No. 7, Yellow Caledonia, and the unstriped cane which occasionally appears in a stool of Big Ribbon are closely allied; in fact between White Bamboo and Yellow Caledonia there appears to be no difference, and after four years trial it is impossible to distinguish one from the other.

The following new varieties will be planted out in June of this year and will be harvested in 1906:

Striped Tip	Demerara No. 1937
Daniel Dupont	Queensland B. 5
Demerara No. 115	Queensland B. 8A
Demerara No. 116	Queensland B. 147
Demerara No. 145	Queensland B. 156
Demerara No. 1135	Queensland B. 176
Demerara No. 1483	Queensland B. 208
Unknown	Queensland B. 244
Dark Colored Bamboo	Queensland B. 306

Some of these are very promising canes and have a noteworthy reputation in other countries, chief among them being: D. No. 115, D. No. 145, B. No. 147, B. 156, and B. 208. Regarding B. No. 147 one West Indian planter writes: "B. No. 147 has the inestimable advantage of being a rough cane outside, with a tough rind, and covered with a coating of dry leaves, which, however, drops off readily when the cane is fully ripe or cut. A spot of this cane which was lately cut for plants, was remarkably free from the common cane borer of which it was very difficult to find a single specimen."

If B. No. 147 sustains its reputation when tried in Hawaii, it will certainly prove a valuable acquisition in some localities.

All of the varieties mentioned in this bulletin as having been cropped during the present year and those which will be planted in June, will be grown for seed for distribution in the spring. It is believed that some of them will be found of value when grown under the various Island conditions.

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STEAM IN THE SUGAR HOUSE.

Without going into the genesis of steam, which is given in any text book, it can be said that there are three kinds known to engineers.

The first; *ordinary working steam*, which carries, entrained with it, more or less water.

The second; *dry saturated steam*, which is very seldom met with, excepting at official tests, and then not often.

The third; *superheated steam*, which is now attracting much attention as a cheap means of increasing economy in the operation of power plants of every description.

Ordinary working steam containing from 2% to 10% of entrained water, is commonly met with in sugar house work. That this is a great waste of heat, water and fuel, seems to have been lost sight of; and yet it is widely known that of the *dry* steam that enters a steam cylinder, from 12% to 20% is lost in initial condensation on the interior surfaces, and in the disappearance of heat due to work done, in the proportion of one British Thermal unit to every 778 foot pounds of energy developed.

This amount of heat lost, is exclusive of that carried off by the entrained water, a great portion of which finds its way into the steam cylinders, giving rise to abnormal conditions, and increasing the tendency of the steam to condense on the interior cylinder surfaces; as it is well known that wet metal surfaces in contact with steam, transmit heat more rapidly than do dry surfaces.

After having passed the steam cylinders in a sugar-house, the working steam is ejected, water and all, (except that amount wasted through the drains), into the exhaust steam mains, and is thereafter used for evaporating purposes.

It is a common saying that exhaust steam is as good as live steam for evaporation; but this is only a half truth, inasmuch as while one pound of exhaust steam contains within 4% as much heat available for evaporative purposes as one pound of steam at 100 lbs., gauge pressure, one pound of ordinary high-pressure steam *will not produce one pound* of exhaust steam after passing steam cylinders and doing work, for the reasons already stated.

It is therefore clear that after deducting cylinder condensation, heat loss due to work done, radiation from steam pipes and passages, and other losses, there is a net loss of the steam furnished by the boilers and used for power, of not less than 20% under the most favorable conditions, and this loss may easily reach 40% or 50% under unfavorable conditions.

The foregoing considerations led the writer to undertake a series of tests for the dryness of steam entering the main engine cylinders at Puunene Mill, and for the dryness of the exhaust steam issuing therefrom.

A barrel calorimeter containing some 300 lbs. of water was used, and tests were made every day for one month, with results that fully confirmed the foregoing statements.

Average steam pressure during tests, (above atmosphere), 88 lbs.

Average dryness of live steam entering cylinders 95%.

Average back pressure on exhaust mains (during tests) 1.96 lbs.

Average dryness of exhaust steam leaving cylinders 85%.

Only one test showed dry steam entering cylinders, and the corresponding test of exhaust steam showed 6% of water in the steam.

It will be understood that these results are from tests taken at various hours of the day and night during regular work, and, as far as the live steam figures are concerned, are confirmed by the report of the official tests made at the Centennial Exposition in Philadelphia, when a large number of boilers were tested for dryness of the steam produced.

According to the official report the dryest steam during the tests at Philadelphia contained .57% of water, and the wettest contained 5.97% moisture.

Since 1876 official tests show less entrainment in steam, but very high pressures are now used, which accounts for the difference.

It may be taken as true that no ordinary steam boiler furnishes dry steam, unless it is worked under very exceptional conditions.

Since live and exhaust steam carry over so much water, it is not surprising that the efficiencies of some evaporating apparatus are not high.

In first-class practice, a triple effect, with clean heating surfaces, will evaporate 2.8 lbs. of water out of sugar solutions by the condensation of one pound of dry saturated steam in the calandria of the first cell.

But if the one pound of steam be referred back to the steam boiler, it will be found under ordinary working conditions, that for every pound of steam, (dry exhaust), taken into the evaporator, 1¼ pounds of water will have to be evaporated into steam by the fuel consumed in the boiler house, so that the ratio of evaporation is not 2.8 — 1, but when referred back to original steam is 2.24 — 1, a very material difference.

The same is true of vacuum pans, but to a less extent, that is, of course, when using exhaust steam.

When using live steam in a vacuum pan, the wetness of the steam and the loss in radiation from the steam pipes are the only factors that reduce its efficiency.

It is a common practice to refer the efficiencies of the various types of evaporating apparatus to the steam, (taken as dry), used in the heating coils and other arrangements; and the work done by many machines, such as multiple effect evaporators, is measured by the condensation in the heating drum of the first cell, assuming this to be the weight of steam condensed therein.

This has led in the past to errors, and it would be safer, and more in accordance with the facts as observed, to refer the efficiencies of evaporating apparatus of all kinds to the fuel consumed in the boiler furnaces.

Since it has been demonstrated that both live and exhaust steam as ordinarily used, is more or less wet, the question naturally arises, can these conditions be altered in any other way than by condemning the boiler plant at vast expense?

As the value of superheated steam for power purposes has been so clearly shown within these last few years, and also that a moderate superheat, say from 100° to 125° Fahrenheit above the saturation temperature of ordinary live steam, has been proven to have no ill effects upon packing or lubrication in the cylinders of engines as ordinarily constructed and used, it seems that the solution of the problem lies in the use of superheated steam of such temperature above the saturation temperature of the steam used, that the exhaust therefrom shall be ejected from the cylinders into the steam pipes leading to the evaporators in a dry condition, so that for every pound of live steam delivered by the boilers, one pound of exhaust steam shall be available for evaporating purposes.

That this will result in a large saving of fuel cannot be doubted, and steps are now being taken in one of the largest sugar factories in this country to introduce *live steam superheaters* for the purpose of accomplishing this desired end.

J. N. S. WILLIAMS.

Puunene, Maui, March 19th, 1904.

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MOLASCUITE.

The above the name which, we believe, has been given to a compound roughly of megass and molasses, which has been found to have a marketable value. It is needless to say that it is entirely to the interest of the sugar manufacturers to secure, so far as they can, a market for the bye-products of the factory. Indeed, it is not going too far to say that the great competitor of cane sugar, namely beet sugar, owes its permanence as an industrial factor to the discovery of various means by which the ordinarily waste materials of the enterprise can be converted into money-making adjuncts of the industry. Thus the beet-growing farmer receives a price for his roots which barely covers the cost of production, and were this all that he was paid he would soon cease to supply the factories with raw material. But he has other means of adding to his livelihood, and those means are corollaries of the production of beet sugar. The tops of the beets are used for fattening cattle and other stock, while each farmer receives back from the factory a certain proportion of the pulp, or exhausted beet chips, which he again turns into money by utilizing it as fodder for his animals. Yet again the beet grower incidentally gains money by rotating his crops and thus securing the benefits which beet roots can under certain conditions do his land. All these factors go to make up the beet producer's profits. Turning to the cane grower, what do we find? More often than not, even after all the homilies that have been preached for years past, he burns his cane tops in the field, thus not only scattering the contained nitrogen to the atmosphere, but also dispersing the valuable organic matter to the four winds. One great source of profit is thus wilfully thrown away. Then again when we come to the factory there are certainly no chips or pulp to be recovered and utilized, and the factory consumes the whole of the megass in the furnaces. In doing this the factory assumes that megass is only worth from 6s. to 8s. per ton. The resultant molasses from a crop are for the greater part waste product. A few convert them into golden syrup, while there are places which utilize them for manure, but it is a safe thing to say that the greater part of the molasses, even allowing for such as is fed to stock, goes to absolute waste down the creeks and drains in the neighborhood of the factories. But even this is not all the loss to factories, for on more than one occasion the final discharge of molasses into creeks or drains has caused outcries from the general public, and, in the name of health, the factories have been compelled to go to considerable expense to obviate the nuisances which have been created. The irony of the position could go no further, when a factory has to pay for the privilege of wasting a very valuable bye-product. The discovery in London of the method of making a cattle fodder out of megass and molasses opens up the possibilities of mills making very considerable additions to their incomes by the manufacture of this food. The samples which have reached Australia go to show that it is possible to make a sweet-smelling and easily handled product, by a very simple process involving but small initial outlay. Thus a machine has been patented which grinds the megass, at the same time separating the inner and soft cells from the outside or coarse and indigestible rind. It has been found by experiment in London, and it has been confirmed by experiment in Mackay, that the soft cells, when dried absorb no less than four times their weight in molasses, and the resultant product, described above as sweet-smelling and easily handled, is worth from £4 5s. to £4 15s. a ton. It will not take much figuring for any thoughtful manager to see that it will pay him, unless the intitial outlay is too great, to reserve a certain portion of his megass, even if he has to burn firewood instead, for the purpose of taking up four times its weight in molasses, and making a product which in London is worth nearly half that of a high grade raw sugar. We are pleased to be in a position to state that this view of the case is steadily forcing itself upon some of our manufacturers. The well known firm of McIlwraith, McEachern & Co., of London, is endeavoring not to sell plants to sugar makers, but to secure from some part of the world sufficient raw material to enable them to produce this new fodder for which there is a keen demand. The cheapness of firewood in North Queensland, and the thorough exhaustion to which the molasses are subject should make this a good field for the profitable initiation of this new branch, or adjunct to the sugar industry. Of course we fully recognize the fact that when the last word is said the value of the product will depend upon the nutritive value of the sample turned out, but there is no reason to suppose that we cannot here in Queensland meet the necessary requirements to maintain our position in the market, and at the same time assure for ourselves the profitable disposition of the huge quantities of molasses which at present go to waste. We commend this matter to the attention of mill managers and others.—The Sugar Journal.

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SUGAR INDUSTRY IN JAMAICA.

An important and largely attended conference of sugar planters and others interested in the industry was recently held in Jamaica. The conference was presided over by his Excellency Sir Augustus Hemming, G.C.M.G., and addresses were given by Sir Daniel Morris, the Hon'ble William Fawcett, Mr. H. H. Cousins, and others.

In opening the conference, his Excellency said that he regarded the question they were about to discuss as the most important that could possibly be brought before any meeting of that kind in Jamaica. He still maintained the opinion that, whatever might be the value of other industries, the cultivation of sugar must be the staple industry of the colony, and although it had of recent years fallen upon troublous times he entertained great hopes that a revival of the industry might be possible.

In addressing the meeting, Sir Daniel Morris mentioned that since he had been in the West Indies he had taken an active part in endeavoring to improve the prospects of sugar growing in these islands. With regard to Jamaica, a mass of reliable information was collected by the Sugar Planters' Association and placed before the Royal Commission of 1897. From that it appeared that there were about 130 working sugar estates in the island; at the present time the number was about 120. It was stated that the average yield per acre in sugar was about 1 ton, but for each ton of sugar there were usually obtained 100 gallons of rum. There were practically no exports of molasses from Jamaica. The Commission was informed that the total cost of producing a ton of sugar and 100 gallons of rum was about £16 for both.

As a sugar-producing country, the opinion of two competent agricultural chemists (Messrs. Watts and Cousins) was that the soil was undoubtedly good and would grow canes as well as, if not better than almost any other part of the West Indies. In fact, Jamaica was extremely well placed by its natural facilities and circumstances for becoming a sugar-producing country. There were also special conditions favorable to the industry. Outside the banana districts, considerable areas were available for sugar growing with contiguous areas suitable for stock rearing and the raising of food-stuffs. It was very much in favor of Jamaica that there were practically no cane diseases, and it was possible to extend cane-farming in certain districts, as had been done so successfully in Trinidad.

As regards labor there might be a difference of opinion, but speaking generally he believed that labor in the sugar districts of Jamaica was not very far short of what might be counted upon as sufficient to carry on the industry, especially if labor-saving appliances were adopted. They also had the possibility of Coolie immigration. It might be said that this was expensive and often unsatisfactory, but still it was possible as a means of carrying on the industry; and he believed the Government would place no obstacle in the way of introducing more Coolies, if their presence were absolutely necessary.

In the matter of the possible improvement in the yield of canes, Sir Daniel remarked that Mr. Cousins was of the opinion that the cultivation of improved seedling canes from Barbados and Demerara would justify a claim to at least 20 per cent. superiority over the canes now grown in Jamaica. He could not recommend seedling canes for any other locality than the one in which they had already been tried and found successful, and emphasized the fact that he did not advise the planter to take up the cultivation of seedling canes unless he were satisfied beforehand that the cane suited his own particular district.

The next point was the possibility of establishing central factories. Proposals had been put forward to start a factory in the Plantain Garden River district. It might also be possible to have a successful factory in the neighborhood of the clay soils of St. Catherine, that were not suited for bananas; in Vere, and on some of the seaside estates in St. James. A central factory, to be successful in any of those districts, must be run on a large scale, but they could not hope to obtain the characteristic Jamaica rum from them. If capital were available and the sugar industry placed on such a footing as to allow of the establishment of central factories, there was little doubt that they would be successful undertakings in certain districts of the island, and especially in those he had named.

In reference to markets for sugar, he might mention that during his recent visit to the United States he had been informed that the preference offered by Canada to the West Indies was not available under all circumstances. Previous to the abolition of European bounties, the preferential rebate offered by Canada to the West Indies was non-effective owing to the United States Government charging a countervailing duty equal to the amount of the bounty paid on European beet when exported. Now that bounties have been abolished and all sugars are on an equality in the United States and the United Kingdom markets, Jamaica will be unable to command a premium in New York. Therefore it was from now on that Canadian preference should show itself. The Canadian refiners would, of course, continue their efforts to secure West Indian sugar at the same price as the United States and the United Kingdom, and take the benefit to themselves of the preferential rebate. So that it rested with sellers in the West Indies to reach an agreement among themselvs, whereby all shippers would refuse to sell to Canada, unless a premium were paid in proof of the preference offered to the West Indies. Otherwise the Canadian refiners would get their supplies at nearly £1 per ton cheaper than anybody else, thereby increasing their own protection at the expense of the West Indies.

The Hon'ble William Fawcett spoke highly of certain seedling canes and stated that when any new cane was heard of, it was at once sent for and propagated at the Hope Experiment Station for distribution to planters.

Mr. Cousins referred to the great possibilities for sugar growing in certain districts that were unsuited to banana cultivation. With the distribution of water in the Vere irrigation area and other localities, they would have magnificent stretches of land that could grow cane, perhaps at a lower price than in any other island in the West Indies. If they could only maintain the old prestige of Jamaica rum there was a further security for the sugar industry on many estates in the island. A fermentation chemist had been engaged and they would endeavor to find out exactly how rum was produced and how the quality could be improved, and in some cases the quantity increased without injury to the quality.

In bringing the conference to a close, his Excellency said it seemed to him that the outlook was distinctly hopeful, and that being so, he could only express sincere hope that there would be a great revival of sugar growing in the island.—The Agricultural News.

WEBSTER CANE LOADER.

The Webster cane loader after a season's run on Waialua Plantation, has just completed a trial on the fields of Ewa. A gang of twenty men was found to load with ease from 15 to 20 tons of cane per hour, and better results should come with use. It has proved to be a labor saving device over present methods of hand loading. Plantations, by its use, will no longer be forced to pick the strongest and ablest of their men for cane loading, for all heavy work is overcome.

The machine is mounted on trucks, to run on the main and portable tracks, and is arranged to permit of empty cars being hauled up an inclined track, over the platform, passing through the frame work of the machine, and down a similar inclined track on the opposite side. This feature of the machine always leaves the main and portable tracks clear, so that seed cane or portable tracks on cars may be drawn over them.

It is provided with six cable drums, any one of which may be connected at will of operator, by means of friction clutches to their shafts, which is driven by a thirteen (13) horse power gasoline engine. Two of these drums are used for hoisting purposes, and four for drawing in cane from a distance. On top of the frame work are two jib-cranes for the hoisting cables.

The mode of operation is as follows: The machine is run over the main track to the field being harvested, and hauled out by mules onto the portable track, convenient to the cane to be loaded. The brakes are then set, the inclined tracks are placed in position, over which the cars to be loaded are hauled, until all but one have passed through the frame of the machine, the last car being left on the inclined track under the jib-cranes. The laborers pile the cane into a bundling rack, which are made of such dimensions as to hold about 500 or 600 lbs. of cane. Patent slings constructed of 5-16" wire rope, with pipe spreader are previously laid on the ground along side the racks and are drawn around the bundles and securely locked. The rack is then taken off by separating the parts. The crane hoisting cables are now used to pick up all the bundles reasonably near the machine and raise them to a suitable height to swing clear of the car. The jib cranes are so arranged as to swing automatically to the center of the car, the man on the car placing it where desired. By withdrawing the bolts on the spreader of the sling by a tap on their handles, after the bundle is in place, the load is instantly detached and the sling withdrawn. This method insures compact and well filled cars. While this is being done the second jib crane is hoisting a second bundle; these

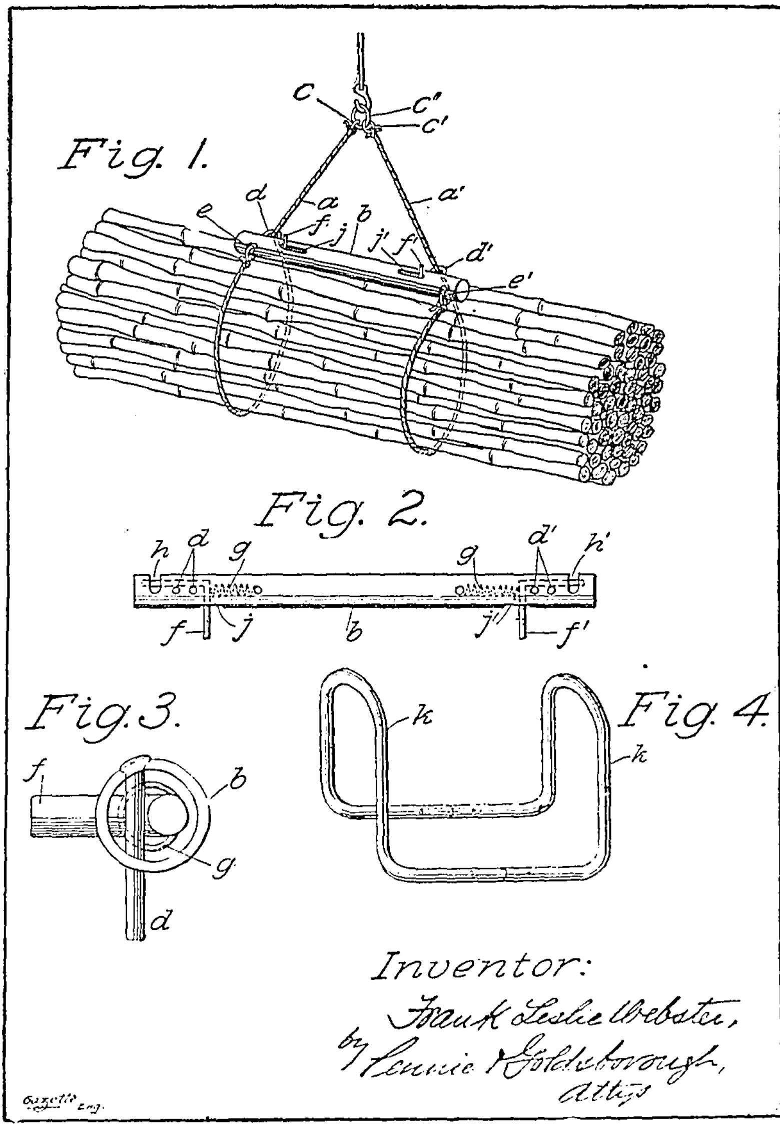

Fig. 1.
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Fig. 3.
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Fig. 4.
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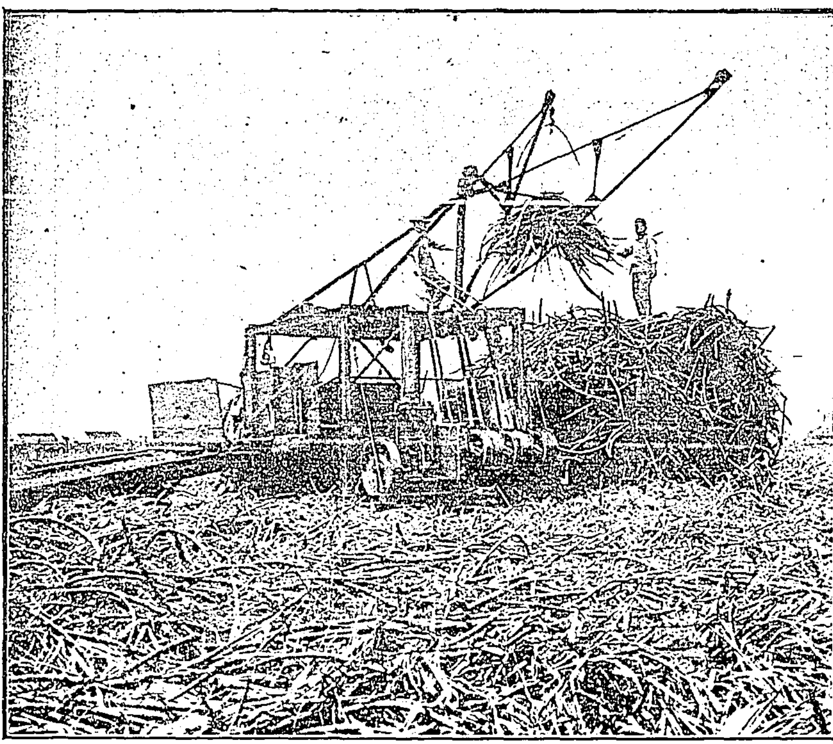
Inventor:
Frank Leslie Webster,
by Pennie & Goldsborough,
Attys

operations are repeated until the car is loaded, whereupon the car is pulled toward the main track and an empty car run through the machine to the loading position. The hauling cables at the same time are being run out and used to draw the bundles from a distance, to where they may be reached by the crane cables. The machine and cars may be moved by power from the machine; but a span of mules are found more desirable.



AN IDEAL SUGAR-CANE.

POSSIBLE REVOLUTION IN THE PRODUCT OF LOUISIANA.

It will probably interest cane-growers in Queensland to learn that a New Orleans journal suggests the possibility, if not the probability, of a great improvement, not only in the weight of the cane crop, but also in the sugar content of the juice and the percentage of juice extractable from the cane. The Southern Farm Magazine reproduces a report published in a Southern exchange on this subject, which states as follows:—

It is announced that Dr. William C. Stubbs, director of the Louisiana experiment station at Audubon Park, has developed a sugar cane which is capable of yielding 30 per cent. more sugar than the cane now grown in the State. In an interview with the New Orleans Times-Democrat, Professor Stubbs says:—

"Six years ago we received a large number of various canes from Trinidad. We promptly began to experiment. We tried to ascertain which cane was best adapted for this climate. We made a score or more experiments and carefully compared the results. We wanted to get a cane that would find ready and congenial growth here in Louisiana, and that would at the same time increase the sugar output for the acreage in this State.

"I am delighted to say that our patience has at length been rewarded. We now have two kinds of cane that are highly successful. They are unquestionably a great deal more satisfactory than the best cane known here for many years. In my opinion, they are the most valuable canes that can be grown in Louisiana soil. They make what our agricultural experts call an ideal specimen. We have classified them as 'T. 95' and T. 74.'

"To the lay public there is nothing exceedingly significant in those words 'T. 74,' but to the sugar-planter they will be nothing less than startling. This cane produces 38 tons to the acre. The juice yields 16 per cent. of sugar. Under a nine-roller mill 81 per cent. is obtained without saturation.

"If you will compare these figures with statistics of cane now grown you will realize that this new cane will revolutionize the sugar industry in Louisiana. The old cane gives an acreage of 20 to 30 tons, with a 12 per cent. yield in the juice. Under the roller it gives a percentage 71.

"The new cane is long-jointed, green, perfectly healthy, and beautiful in appearance. It has an excellent stubble and remarkable vigor. It withstood the terrific gale that swept over the city on 9th and 10th September. It is deep-rooted and strong, and was the only cane in the field that was not blown either flat or partly down to the ground. It was not damaged the least bit by the storm.

"We are ready and willing to furnish this cane to any planter who may apply for it. We expect to send out more than 500 bundles in the next few weeks. Requests for the cane are coming in on every mail. We shall begin to ship the cane in a few days. Planters throughout the State show intense interest, and have strong faith in the new specimens. We shall send some of the cane to the experiment stations in Cuba and the Hawaiian Islands."—Queensland Agriculture Journal, April, 1904.

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CHEMICAL SELECTION OF THE SUGAR-CANE.

The subject of the possibility of improving the sugar-cane by selecting canes in the field remarkable for size, prolificness, early maturity and high saccharine quality, and of producing from these selected canes, by tops or cuttings a succession of canes possessing similar or improved qualities was discussed in the Kew Bulletin (1894, pp. 86-96; 1897, pp. 317-318, and 1899, pp. 45-46).

A further contribution on the same subject appeared in a paper by Professor d'Albuquerque, in the West Indian Bulletin (Vol. I, p. 185).

The following is a brief extract from this paper:

"Looking at the matter from a theoretical standpoint, one cannot help thinking that canes produced from the buds of a parent cane, are likely even if grown under precisely similar conditions (if it were possible to do so) to manifest slight differences in their various properties, such as the length of their joints, the amounts of sugar and other substances in their cells, the germinative power of their buds and so on. One would expect that the canes so produced from buds, while exhibiting no striking variation from the parent, would oscillate as it were in their properties about the mean formed by the parent plant, and that by selecting the canes richest in one of these properties (say sugar production), the canes produced from the buds of the daughter canes, would oscillate in their properties about a new mean (that of their mother canes) and a mean slightly higher than that of what I may call the grandmother cane. And one would expect that by a repetition of this process of selecting the richest from which to propagate, the average richness of the variety would be increased. Admitting that it is possible for the sugar cane to contain more sugar than it does now, it does not, in order to test the theoretical possibility of this enrichment, seem necessary to me to show, as suggested, those striking variations known as 'bud variation; the essence of the idea lies in a gradual integration of small differences, and not in a change *per saltum*."

We are aware of the difficulties that surround an investigation of this kind and also that there are one or two scientific men who have already expressed an opinion adverse to the success of such an investigation. On the other hand, there are equally experienced and competent men who are not prepared to abandon the idea until it has been more fully worked out.

With the view of placing the facts on record and leaving them for the present to speak for themselves, we quote the following from an Appendix to the Report on the "Sugar-cane Experiments in the Leeward Islands for the season 1900-1901" by Mr. Francis Watts, B.Sc., F. I. C., F. C. S., (Part I, pp. 31-32):

From time to time the idea has been put forward that material improvement may be effected in the sugar-cane by selecting, for planting, cuttings from the richest canes. Edson, Kobus, and Bovell have worked in this field, their work being conveniently summarized in the Kew Bulletin, already referred to.

In these investigations a difficulty at once arises in determining which is the richest cane, for a sugar-cane before flowering is in a condition of continuous growth, so that its upper joints are unripe while the lower ones are of varying degrees of ripeness. The composition of the juice from such a cane will therefore vary in character in the proportion which the unripe joints bear to the ripe ones. Similarly, every cane in a bunch varies from its neighbors.

It was thought that this difficulty might be largely overcome if the canes were judged on the character of the juice obtained from the basal joints only, and that the juice thus obtained might be held to indicate, more closely than the juice from the whole cane, the character of the whole cane when ripe, and that in this way a better selection of rich and poor canes might be made. This method is practically that followed by Bovell, but he does not appear to have proceeded on any systematic lines as regards the manner of cutting, that is, he did not cut his canes at any fixed point in relation to the base, nor does he explain if short canes were excluded.

Accordingly on March 9, 1900, 200 canes of the White Transparent variety were taken; each cane was of such a length that it had not less than ten joints; the basal portion of the cane was cut off in the middle of the fifth internode, this portion was crushed in the Chatanooga mill and the juice polarized. The tops were then cut from the ten canes which afforded the richest juice. Similarly the tops were taken from the ten canes which afforded the poorest juice. From each cane three plants were obtained, thus giving 30 "high" and 30 "low" canes.

The following table gives the amount of sugar, in pounds per gallon, of the juice of the selected canes:

"High" canes planted.	"Low" canes planted.
2.375	1.496
2.336	1.581
2.319	1.634
2.314	1.647
2.298	1.716
2.274	1.746
2.272	1.754
2.266	1.775
2.258	1.809
2.245	1.831
Mean 2.296	Mean 1.699

By conducting two series of experiments, one directed towards securing a richer, and the other a poorer cane, the results of the selection will be made more evident by the divergence of one series from the other if the method produces any results.

On February 28, 1901, the canes thus grown were reaped, 200 canes of the requisite length being taken from each plot and examined as in the previous case. From the "high" plot the ten canes yielding the richest juice were selected and employed for planting another "high" series. Similarly from the "low" plot the ten canes yielding the poorest juice were taken for planting another "low" series. These will be repeated in 1902.

The following table gives the amount of cane sugar, in pounds per gallon, of the juice of the selected canes:

"High" canes planted.	"Low" canes planted.
2.181	1.522
2.152	1.554
2.131	1.573
2.123	1.576
2.110	1.581
2.102	1.598
2.091	1.599
2.091	1.599

"High" canes planted.	"Low" canes planted.
2.072	1.629
2.072	1.637
Mean 2.113	Mean 1.587

The canes thus selected for the second trial diverge somewhat more widely than those employed in the first.

The arithmetical means of the results obtained upon polarizing the juice of the 400 canes are as follows:

Mean of 200 "high" canes...1,925 lb. sucrose per gallon.
Mean of 200 "low" canes....1,905 lb. " " "

Difference............ .020 lb. sucrose per gallon

Thus showing a gain of 1 per cent. in favor of the "high" canes; this is so small an amount that it may lie entirely within the limits of experimental error.

These experiments are placed upon record without any attempt to draw conclusions from them at so early a stage; it is evident that many years must elapse before definite conclusions can be drawn. Efforts will be made to continue these experiments for several years.

In the following year in an Appendix to the Report on the "Sugar-cane Experiments in the Leeward Islands for the season 1901-1902," by Mr. Francis Watts, B.Sc., F.I.C., F.C.S., (Part I, pp. 52-55), there is further information on chemical selection of the sugar-cane as follows:

The work in connection with the experiments reported upon in the Appendix of last season's report has been continued on the lines therein laid down.

It will be remembered that these experiments consist in selecting (a) a series of canes rich in sucrose, called "high" canes, and (b) a series of canes poor in sucrose, called "low" canes, and planting cuttings from the canes thus selected.

The following year the ten richest canes are selected from the rich or "high" plot, and the ten poorest canes from the poor or "low" plot, and these are again planted.

The object of the experiments is to ascertain whether the saccharine content of the sugar-cane can be affected by selection of cuttings.

The canes are examined by cutting off the basal portion in the middle of the fifth internode from the base, crushing this basal portion in the Chatanooga mill, and determining the amount of sugar in the sample of juice so obtained by means of the polariscope. No cane is examined which has less than ten joints. All the comparisons and all the analyses mentioned in this Appendix are based upon samples obtained in this manner.

The average sugar content of the juice of the canes selected for planting in the first experiment was:

"High" canes ....2.296 lb sucrose per gallon
"Low" canes ....1.699 lb sucrose per gallon

From these there was grown a crop of canes which upon examination in the manner described gave juice having the following sugar content:

"High" canes ....1.925 lb sucrose per gallon
"Low" canes ....1.905 lb sucrose per gallon

200 canes from each plot being separately examined; from these ten canes were selected from each group and each cane afforded three cuttings; the canes grown from these cuttings are now reported upon. In this year's experiments a record has been kept of the character of the juice obtained from each of the twenty canes: a comparison of the juice obtained from the parent canes and from the progeny is given in the two following tables:

"High" Canes.

Cane sugar per gallon of juice expressed from basal portion of canes.

Cane used for planting. 1901.	Canes reaped 1902.	Difference.
2.181	1.934	—.247
2.152	2.115	—.037
2.131	1.799	—.332
2.123	2.179	+.056
2.110	2.054	—.056
2.102	1.552	—.650
2.091	1.910	—.181
2.091	1.900	—.191
2.072	2.155	+.083
2.072	2.242	+.170

"Low" Canes.

Cane sugar per gallon of juice expressed from basal portion of cane.

Cane used for planting. 1901.	Canes reaped 1902.	Difference.
1.522	1.637	+.135
1.554	1.780	+.226
1.573	1.947	+.374
1.576	1.759	+.183
1.581	1.921	+.340
1.598	1.998	+.400
1.599	1.886	+.287
1.599	1.839	+.240
1.637	1.567	—.070

The arithmetical means of the results obtained upon polarizing the juice from all the canes from the "high" plot and all the canes from the "low" plot are as follows:

Mean of 163 "high" canes	2.011 lb.	sucrose per gallon
Mean of 153 "low" canes	1.793 lb.	" " "
Difference	.218 lb.	" " "

The gain this season is therefore over 10 per cent. in favor of the "high" canes.

There was considerable variation amongst the individual canes; advantage was taken of this to select the ten richest from the high canes, and the ten poorest from the low canes for the purpose of starting two new plots. The following table gives the sugar content of the juice of the selected canes, which are now planted to produce canes for comparison in 1903:

"High" canes planted.	"Low" canes planted.
2.348	1.010
2.330	1.121
2.314	1.259
2.314	1.265
2.277	1.350
2.269	1.382
2.269	1.384
2.266	1.408
2.266	1.430
2.258	1.443
Mean 2.291	Mean 1.305

Difference .986 lb. per gallon.

The difference between the high and low canes used for planting for the season 1902-3 is much greater than it has been upon the two previous occasions when the differences were .597 lb. and .526 lb. sucrose per gallon.

The results of this year's experiments appear to indicate that the canes are influenced by the selection, as there is a difference of over ten per cent. between the sugar content of the high and the low canes. Whether similar differences will be maintained in future experiments it is impossible to say. Knowing the danger of generalizing from insufficient data, it is deemed desirable to place the facts upon record and to continue the experiments, without, at this stage, endeavoring to draw conclusions from them.

In comparing the juice of the canes used for planting with the juice afforded by the canes raised from them, it will be seen that in the case of both the "high" and the "low" series there is a tendency to return to the mean or normal: most of the "high" canes planted afforded progeny yielding on the average poorer juice than the parent canes, whilst most of the "low" canes planted produced canes yielding on the average juice richer than the parent canes; but on the whole, this year, the normal or mean was not reached, as the difference between the average of all the canes of the two groups (.218 lb. sucrose per gallon) clearly shows.—West Indian Bulletin.

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HYBRID SUGAR-CANES.

A recent issue of the West Indian Bulletin (Vol. IV, p. 63), contains an article by Mr. L. Lewton-Brain, the Mycologist and Agricultural Lecturer to the Imperial Department of Agriculture, on "Hybridization of the Sugar-cane," in which the possibilities of raising hybrid varieties of sugar-cane are discussed and an account is given of some observations by the writer on the structure of sugar-cane flowers.

The idea of raising hybrid sugar-canes is by no means a new on in the West Indies; it was raised by Professor d'Albuquerque at the second Agricultural Conference in 1900 (West Indian Bulletin, Vol. I, p. 182); Professor Harrison and Mr. Hart have both mentioned the possibility that some of the seedling canes, which are being raised throughout the West

Indies, are the result of the accidental crossing of two varieties of cane, and in the Agricultural News (Vol. I, p. 146) we drew attention to some successful experiments that have been made in Java, by Drs. Wakker and Kobus, in hybridizing various varieties of canes, more particularly the Cheribon and an imported Indian cane, the Chunnee.

The process adopted in Java was an extremely simple one. Dr. Wakker discovered that the pollen (the part of the flower containing the male elements) of certain varieties of cane, notably the Cheribon, was infertile, while the ovary (the female part of the flower) was normal. Other varieties of cane, including the Chunnee, were shown to possess normal, fertile pollen. It was only necessary, therefore, to plant canes of two varieties, one with normal pollen and one without, in alternate rows, the wind would then carry the normal pollen of the one variety to the ovary of the other, fertilization would take place and seeds would be produced. These seeds, borne on the variety with infertile pollen, would, necessarily, be the result of a cross, and the canes raised from them would be hybrids. In the case of the Cheribon and Chunnee canes the experiment was a success: the Cheribon produced fertile seeds, and since then Dr. Kobus has succeeded in raising many thousands of hybrid canes.

The first question to arise in the mind of a practical man woul be: Is it worth while? Or, in other words: What advantages does this new method of obtaining fresh varieties possess over the method of raising seedling canes which has been in operation for some years and which has been very successful? That the method of raising new varieties by hybridization does possess advantages over the simpler process of raising them by selection is amply shown by the fact that it is practised by plant breeders all over the world. It must be remembered, too, that the sugar-cane is, probably, the only cultivated plant, with regard to which the raising of hybrids is such an easy matter as described above. With other plants artificial crossing has to be resorted to, and this is a very delicate operation, necessitating great care.

Mr. Lewton-Brain points out that crossing offers two advantages. In the first place the hybrid offspring of a cross is far more variable than pure-bred plants, so that the chances of obtaining a valuable seedling are proportionately increased. Again, it has often been found possible to combine in a hybrid the good qualities of both parents, as for example a large yield with excellent quality, or hardiness with good yield.

That this can be done is shown by the results obtained by plant breeders in other parts of the world. Messrs. Garton in England have obtained numerous hybrid varieties of wheat, oats and other cereals which combine the good qualities of both parents. Mr. Farrer in New South Wales, again, has succeeded in raising hybrid varieties of wheat which combine resistance to disease with high yield and other good characters. Hybrids between good wine-producing and disease-resisting varieties of the grape vine have also been obtained combining these qualities of the parents. It is, however, not necessary to go further afield than the experiments of Drs. Kobus and Wakker mentioned above. As a result of crossing the Cheribon and Chunnee, "canes combining both high sugar content and disease-resisting power have been obtained."

In Mr. Lewton-Brain's paper the results of his observations on the pollen of West Indian varieties of sugar-cane are given. Of the canes examined, sixteen varieties were found to possess "a very small proportion of normal pollen," while eighteen showed "a large proportion of normal pollen." It is evident that hybrids might easily be raised between two varieties, one from each of these classes, on the lines followed by Drs. Wakker and Kobus.

It must be remembered, however, that success must not be looked for at the first trial; hybrids will probably be obtained; but most, if not all, of them will prove inferior to the parents. If one or two good hybrids are obtained after numerous trials, the experiments will be as successful as could have been expected.—Agricultural News.

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SEEDLING CANES.

Considerable difficulty has hitherto been experienced in raising seedling sugar-canes in Antigua; for several years all results ended in failure; either no seeds germinated, or the very few which did germinate died at an early stage of growth.

In 1901 three seedlings were raised in the nursery, and produced well-developed plants for reaping in 1903.

During the arrowing period in 1902 Mr. Sands, the Curator of the Botanic Station, Antigua, made several efforts to obtain seedlings.

Arrows of D. 95 were selected and in these, pieces of arrows of White Transparent, Sealy Seedling and D. 95 canes were tied in order to provide pollen. Some of these arrows so treated were enclosed in muslin bags but the bags were destroyed by the rain and the wind. The remaining arrows were not so enclosed; these escaped injury and were collected for seed. Under the circumstances one cannot be sure that the stigmas were fertilized by pollen from the arrows thus brought near them.

Other ripe arrows of various kinds were collected without any attempt to pollinate them with any specific pollen.

The arrows were sown at intervals from January, 1903, and on this occasion a plentiful crop of seedling canes resulted. Amongst those germinating most freely were seeds in arrows of D 61, Red Ribbon, Naga B., and D 102.

The seedlings were planted out in a field at Skerrett's on May 5, 1903, as follows:

182	seedlings	from	arrows	from	cane	D. 61.
56	"	"	"	"	"	Naga B.
42	"	"	"	"	"	White. Transarent
21	"	"	"	"	"	D. 116.
77	"	"	"	"	"	Red Ribbon
112	"	"	"	"	"	D. 102
21	"	"	"	"	"	Sealy Seedling.
35	"	"	"	"	"	Sealy Seedling x D. 95.

Most of these are now growing freely; those which have satisfactory field characters will be submitted to chemical examination in the usual way. Should there result any canes of good promise they will ultimately be tested by being sumbitted to experimental cultivation.—Seedling and Other Canes in Leeward Islands.

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OVERPRODUCTION OF SUGAR IN FRANCE.

At present sugar sells for less in France than the cost of the cultivation of the beet root. As a result of the Brussels conference, as far as France is concerned, the situation grows gradually worse. The report that Germany and Austria have not diminished the acreage planted in beet root seriously affects the market. Cultivators are offered the ridiculous price of $3.28 and $3.47 a ton for beet roots—less even than that for potatoes. The high price of alcohol also has its effect. Many French journals assert that the only course to save the situation is for France, Austria, and Germany to reduce their production 50 per cent. It seems the opposite course, however, which the two latter countries are pursuing. New uses for sugar are also being sought for, such as its employment for brewing, feed for animals, etc. In France the acreage for the coming harvest will be greatly reduced. Many factories—as many as 30, it is said—will be closed next harvest.—Thornwell Haynes, Consul, Rouen, France.

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THE SUGAR INDUSTRY IN EGYPT.

For some time past the attention of the sugar world has been repeatedly drawn to the latest evolution of the sugar industry in Egypt. It therefore seems worth while giving the substance of the latest information as to the present condition of affairs.

The year 1903 marked an epoch in the development of the sugar industry in Egypt; in so far that the nine sugar factories of the Daira Sanieh worked for the last time under State control, and at the end of the same year the total production of Egyptian sugar, which has varied during the last few seasons at between 90,000 and 100,000 tons, had with the exception of that from a few small private factories of no importance, fallen into the hands of the Societe Generale des Sucreries et de la Raffinerie d'Egypte.

In a preceding account it was stated that the Daria had decided to sell its nine factories to a Syndicate formed for this object, and that the latter would undertake the disposal of them to the societe Generale. Since then the transactions have been carried out. In November, 1902, the Daira sold its nine factories and their stock, consisting of 520 kilometres of railway, 55 locomotives, and 2,100 wagons to the Daira Sugar Corporation, Ltd. The sale price was £944,800 sterling, being £171,800 cash and £773,000 in securities at 4%.

The transfer was first fixed for October, 1905, but the date was subsequently altered to April, 1903, under payment of a net sum of £850,000 sterling. The Societe Generale on its part has contracted with the Daira Sugar Corporation to run the usines for a period of 25 years under payment of 24 annuities of £112,000 sterling each. At the end of 25 years the Societe Generale will become sole proprietors of the objects of the sale. The transfer of the factories was to have been carried out on April 1st, 1903.

The Societe Generale does not at present intend to work more than six of its newly acquired factories, but will considerably enlarge these six. It will be possible to treat 12,000 tons of cane per diem, and, in order to undertake fresh expenses, the Company has increased its capital by some 44 million francs. It calculates that the cane needed for this increased production will be easily obtained, thanks to the new barrage at Assuan which will permit cane cultivation on vast tracts of hitherto sterile lands in Upper and Middle Egypt. The conditions existing hitherto, when cane has often failed for want of proper irrigation, are no longer expected to occur, and it is possible that the next crop may see a remarkable increase all round.

In the last campaign (1902-03), which extended from the middle of December to the beginning of April, eight of the nine Daira factories were at work, but the campaign was very short for some of them. The minimum was 52 days and the maximum 93, the mean 76 days; 501,682 tons of cane were worked up, producing 46,264 metric tons of No. 1 sugar. This was the lowest figure of production at Daira since 1892.

The yield in 1st jet sugar was in 1903 9.22% of cane, as compared with 10.01% and 9.81% respectively in the two preceding years. The 1903 cane was therefore relatively poor in sugar; this was accounted for by the unfavorable climatic conditions which prevailed in that season.

The second and third sugars are only found to a limited extent in the Daira production. In 1902, 52,697 cantars of 2nd and 20,171 cantars of 3rd sugar were produced, as well as 257,182 cantars of molasses.*

For alcohol manufacture only a portion of the molasses was used, amounting to about 126,000 cantars in 1902. According to the annual official report of Daira the molasses realized in 1901 3 piastres per cantar and the alcohol 1 piastre 17.6 para per oka of 1.24 kg. The advantage of distilling the molasses, as compared with selling it, is therefore doubtful.

The total production of sugar during the campaign of 1902-03 seems to have attained to 50,000 tons. This was a decrease of 10,000 tons on the preceding campaign. The production of the Societe Generale, whose three usines had a capacity of 5,500 tons of cane per diem, has not yet been published—being kept back for the annual report. In the last report for

*1 cantar = 45 kg.

the period between November 1st, 1901, and October 31st, 1902, some 352,512 sacks (of 100 kg.) of sugar were obtained, against 305,473 in the preceding campaign. The excess of 47,039 sacks was less than anticipated, owing to an insufficient rise in the Nile. Ten years ago the Societe's production was only 41,000 sacks.

Several repeated attempts at beet growing only ended unsatisfactorily, and in some quarters it is said that all further trials in that direction are abandoned. The Journal d. F. de S., however, thinks this not accurate, and says the sowings have only been temporarily reduced, as a series of bad Niles has resulted in a plague of insects very destructive to the beet. But with a favorable rise of the river once more, there is no longer any reason for not continuing the experimental beet culture.

The British Company, founded in 1896, the "Egyptian Sugar and Land Company" lent its Baliana factory, with all its appurtenances, to the Societe Generale in 1901 for a period of five years, renewable at the option of the latter company for a further five years. This factory has been inactive during the last two campaigns.

In the meanwhile the Sugar and Land Company seems resolved to go into voluntary liquidation. Consequently it no longer counts in the sugar industry. Of the several other private factories existing in Egypt only one was in work during 1903, this being the one belonging to the Executors of Sultan Pasha at Damaris, near Minieh. Its campaign lasted 79 days, ending 8th March. In that time 563,931 cantars of cane were treated, and 46,892 cantars of sugar obtained, being a little over 8.3% of cane.

In all the production of sugar in Egypt in 1902-03 should have been about 87,500 tons, supposing the production of the Societe Generale was equal to that of the previous year. In that case it was 10,000 tons less than the previous campaign.

In order to appreciate the situation in the Egyptian sugar market, it is worth while giving the figures appearing in the last report of the Societe Generale touching the refinery output. Their refinery sold in the 1901-02 campaign 38,091 tons of sugar as compared with 33,873 tons in 1900-01, and 30,034 tons in 1899-00.

Of these increasing amounts, the largest part has been taken up by local consumption, being 31,023 tons in 1901-02, and 27,657 tons in the preceding campaign. Exports have shown but a small increase in that period, 7,068 tons against 6,217 tons. But in spite of the increased sales of refined sugar in the home market, the imports of similar foreign sugar have shown appreciable progress. They have been according to the Customs:

Year.	Tons.
1902	10,362
1901	7,424
1900	6,041
1899	2,738

These figures point to a very rapid development in the Egyptian sugar consumption, and enable one to appreciate the extent to which it is capable of yet attaining. From what has been said, Egypt should actually have a consumption of about 41,000 tons. For ten million inhabitants, this is about 4 kg. per head per annum. On this basis about a quarter is furnished by the importation of foreign sugar. The foreign import consists chiefly of Austrian and Russian sugar, and in 1902 Austria was responsible for 80% of the total.

The price of sugar on the local market at Alexandria has been of late for native sugars from 40 to 60 piastres per cantar of 45 kg. (10 fr. to 11.25 fr.).

The exportation of raw sugar has decreased in the last few years, owing to the increasing requirements of the Hawamdieh refinery, the only establishment of its kind existing in Egypt. In 1900 it exported 49,488 tons of refined and 4,292 tons of raw. In 1902 the figures were 41,242 tons and 3,417 tons respectively. The principal customers have been America, Turkey, the Red Sea, and the Persian Gulf.—Abridged from the Journal de F. de S. by International Sugar Journal.

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ECONOMICAL FEEDING ON SUGAR ESTATES.

In an article on this subject in the Sugar Planters' Journal of February 13, a review is given of the progress that has been made in utilizing the by-products of the sugar industry for feeding purposes. It is shown that there is a great increase in the use of molasses as a stock food; the favorite method being to give 1 to 1½ gallons per head mixed with grain or chopped hay instead of allowing the stock to feed from troughs direct. In this way the injurious effects attributed to molasses when fed in excess, are avoided.

The economy of grinding corn is also being more freely recognized, it being known that the meal from cob, grain and stalk forms an easily digestible mixture, while considerably less grain is used.

It is also being found that molasses is useful in giving a pleasant flavor to chopped foods such as pea vine hay, cane tops, corn stalks, etc.

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SUGAR-CANE EXPERIMENTS IN INDIA.

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A Bulletin has recently been published by the Madras Agricultural Department giving an account of the experiments that are being conducted at the Sugar-cane station at Samalkot in the Godavari district. The following extracts from the Bulletin, which is written by Mr. C. A. Barber, M.A., F. L.S., are likely to be of interest:

The growing of sugar-cane in the Godavari district, which was in former times so profitable an undertaking, has, during the last few years, suffered very considerably because of the disease which has attacked the canes.

This disease has received very careful attention by the Agricultural Department, and a special Government garden has been opened at Samalkot for its study and that of cane cultivation generally. The following remarks show what is being done in this garden.

The canes are being grown in all sorts of different ways. The objects of these experiments are:

(1) To see if by any particular method of planting and cultivation the disease may be lessened and healthy canes may be grown, and

(2) To test the mode of planting sugar-cane in other countries, particularly the West Indies, so as to lessen the great expense to which the ryot is put in this country.

Another fact which must be borne in mind is that plants as well as animals are like their parents, and if a diseased piece of seed is put in, the plants which grows it will also be diseased. It is he spends much money in tying and wrapping his canes; then very foolish for the ryot to leave for seed that part of his field which is too poor to make jaggery. And yet this is very often done. All seed *with any red mark in it* must very carefully be separated and on no account planted. This is done every year at the Samalkot station.

So much for the growing of healthy canes; now for the modes of cultivation in other countries. The ryot usually spends much money on sugar-cane cultivation. Some of this is wisely spent, but some of it is unprofitable. In the Godavari district he plants a very great number of cane sets to the acre; and lastly, uses a vast number of bamboos to support them. Fewer seed are used in other countries; no wrapping is done, and no bamboos are used. This is managed by planting the canes in a different manner—by deeper cultivation and by draining the land better. The plants are also put further apart and so become self-supporting bushes instead of long poles, like the bamboos to which they are tied. Experiments are being tried in this matter at Samalkot, where ryots can see for themselves what is being done.

There are, for instance, several plots which have been planted with only one-third the seed canes that are usual; no wrapping has been done, and no bamboos are used. It will be interesting to see the results. Of course the cultivation of the ground is deeper, and the drainage is very carefully attended to. This will show that attempts are being made to grow canes cheaply, and the exact mode will be explained to any one who takes the trouble to come and look at the Government Garden.

Careful trials are being made at Samalkot to produce a better class of compost for the fields. For this purpose, pits are dug in the ground, 6 feet across each way and 4 feet deep. Into these pits are thrown all rubbish, sweepings, dead leaves, paddy husks, ashes, cattle manure and even fresh grass and bushes, until the pit is full. It is then covered over with earth and left until the time for ploughing. When it is opened, one of these pits is found to contain many cart loads of excellent manure.—The Agriculture News.

ERRATUM.

Through inadvertance the article on Oils in the April issue of this paper is attributed to Mr. John M. Edgar instead of Mr. William H. Edgar. Mr. Edgar is the president of the Dearborn Drug and Chemical Works and recently visited Honolulu.

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Laie Plantation	x*x	S. E. Wooley	Laie
MAUI.			
Olowalu Co.	**	Geo. Gibb	Lahaina
Pioneer Mill Co.	x	L. Barkhausen	Lahaina
Wailuku Sugar Co.	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sug. Co.	x*	H. P. Baldwin	Puunene
Hana Plantation	xx	E. Worthington	Hana
Maui Agricultural Co.		H. A. Baldwin	Paia
Kipahulu Sugar Co.	x	A. Gross	Kipahulu
Kihei Plantation Co.	x*	James Scott	Kihei
HAWAII.			
Paauhau Sugar Plantation Co.	**	Jas. Gibb	Hamakua
Hamakua Mill Co.	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	J. M. Horner	Kukaiau
Kukaiau Mill Co.	*x	E. Madden	Paauilo
Ookala Sugar Co.	**x	W. G. Walker	Ookala
Laupahoehoe Sugar Co.	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	Geo. Ross	Hakalau
Honomu Sugar Co.	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co.	**x	James Webster	Pepeekeo
Onomea Sugar Co.	**x	J. T. Moir	Papaikou
Hilo Sugar Co.	**	J. A. Scott	Hilo
Hawaii Mill Co.	x	W. H. C. Campbell	Hilo
Waiakea Mill Co.	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co.	**x	W. S. Ogg	Pahala
Hutchinson Sugar Plantation Co.	**	C. Wolters	Naalehu
Union Mill Co.	*x	Jas. Renton	Kohala
Kohala Sugar Co.	*	E. E. Olding	Kohala
Pacific Sugar Mill	x**	D. Forbes	Kukuihaele
Honokaa Sugar Co.	x**	K. S. Gjerdrum	Honokaa
Kona Sugar Co.	xxx	E. E. Conant	Holualoa
Olaa Sugar Co.	xx*	F. B. McStocker	Olaa
Puna Sugar Co.	xx*		Kapoho
Halawa Plantation	x*x	T. S. Kay	Kohala
Hawi Mill & Plantation	‡‡	John Hind	Kohala
Puako Plantation	‡‡	W. L. Vredenburg	S. Kohala
Niulii Sugar Mill and Plantation	*x	Robt Hall	Kohala
Puakea Plantation	*x	H. R. Bryant	Kohala
KAUAI.			
Kilauea Sugar Plantation Co.	**	A. Moore	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co.		G. H. Fairchild	Kealia
Grove Farm Plantation	x		Lihue
Lihue Plantation Co.	x	F. Weber	Lihue
Koloa Sugar Co.	x	P. McLane	Koloa
McBryde Sugar Co.	*x	W. Stodart	Eleele
Hawaiian Sugar Co.	x*	B. D. Baldwin	Makaweli
Waimea Sugar Mill Co.	*	J. Fassoth	Waimea
Kekaha Sugar Co.	x	H. P. Faye	Kekaha

KEY.	HONOLULU AGENTS.	
	Castle & Cooke	(5)
**	W. G. Irwin & Co.	(8)
***	J. M. Dowsett	(1)
x	H. Hackfeld & Co.	(9)
xx	M. S. Grinbaum & Co.	(2)
xxx	H. Waterhouse & Co.	(1)
*x	T. H. Davies & Co.	(9)
**x	C. Brewer & Co.	(5)
x*	Alexander & Baldwin	(6)
x**	F. A. Schaefer & Co.	(3)
xx*	B. F. Dillingham & Co.	(2)
x*x	H. Waterhouse & Co.	(3)
‡‡	Hind, Rolph & Co.	(2)

HONOLULU STOCK AND BOND EXCHANGE, JUNE 16, 1904.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co.	$ 1,000,000	10,000	$ 1,000,000	$ 100	390
SUGAR					
Ewa Plantation Company	5,000,000	250,000	5,000,000	20	20
Hawaiian Agricultural Co.	1,200,000	12,100	1,200,000	100	102½
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	50
Hawaiian Sugar Company	2,000,000	100,000	2,000,000	21	21
Honomu Sugar Company	750,000	7,500	750,000	100	100
Honokaa Sugar Company	2,000,000	100,000	2,000,000	20	13
Haiku Sugar Company	500,000	5,000	500,000	100	100
Kahuku Plantation Company	500,000	25,000	500,000	20	18
Kihei Plant. Co. Ltd.,	2,500,000	50,000	2,500,000	50	5
Kipahulu Sugar Company	160,000	1,600	160,000	100	
Koloa Sugar Company	500,000	5,000	500,000	100	125
McBryde Sug. Co. Ltd.	3,500,000	175,000	3,500,000	20	3
Oahu Sugar Co	3,600,000	36,000	3,600,000	100	90
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	24
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	10½
Olaa Sugar Co. Ltd.,	5,000,000	250,000	5,000,000	20	3
Olowalu Company	150,000	1,500	150,000	100	
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	12
Pacific Sugar Mill	500,000	5,000	500,000	100	
Paia Plantation Company	750,000	7,500	750,000	100	250
Pepeekeo Sugar Company	750,000	7,500	750,000	100	
Pioneer Mill Company	2,750,000	27,500	2,750,000	100	75
Waialua Agricultural Co.	4,500,000	45,000	4,500,000	100	40½
Wailuku Sugar Company	700,000	7,000	700,000	100	275
Waimanalo Sugar Company	252,000	2,520	252,000	100	160
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	115
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	95
Hawaiian Electric Company	500,000	5,000	500,000	100	
Honolulu R. T. & Land Co.	1,250,000	P. 3,390 C. 8,000	1,139,000	100	97½ 72
Mutual Telephone Company	150,000	15,000	150,000	10	9
Oahu Railway & Land Co	4,000,000	40,000	4,000,000	100	75
Hilo Railroad Co.	1,000,000	50,000	1,000,000	20	17
BONDS	Auth. of Issue		Amt. Issued		
Hawaiian Govt. 5 per cent	$ 936,000		870,000		100
Haw. Terr'l. 4½ per cent	5,000,000		1,000,000		
Haw. Terr'l. 4 per cent Fire Claim)	326,000		315,000		96
Hilo Railroad Co., 6 per cent	1,000,000		1,000,000		100
Hono. R. T. & L. Co, 6 p. c.	1,000,000		610,000		104
Ewa Plantation 6 per cent	500,000		400,000		100
Oahu Railway & L'd Co. 6 p. c.	2,000,000		2,000,000		104
Oahu Plantation 6 per cent	750,000		750,000		100
Olaa Plantation 6 per cent	1,250,000		1,250,000		100
Waialua Agr. 6 per cent	1,000,000		1,000,000		100
Kahuku 6 per cent	200,000		200,000		100
Pioneer Mill Co., 6 per cent	1,250,000		1,250,000		100
Paia Plant. Co., 6 per cent	450,000				100
Haiku Sugar Co., 6 per cent	300,000				100